

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) An image pixel structure, comprising:

a semiconductor substrate of a first conductivity type having a surface;

a gate over a surface of the substrate; and

a photodiode within said substrate, said photodiode including an implant region of a second conductivity type, a first portion of said implant region having a lower boundary in said substrate and extending of which extends further towards a region of said substrate beneath said gate than a second portion of said implant region extends towards said region beneath said gate,

wherein said second portion is adjacent to and substantially underneath said first portion such that said lower boundary of said first portion forms an upper boundary for at least a part of said second portion.

2. (Original) The image pixel structure of claim 1, wherein the substrate is p-type, and the implants are n-type.

3. (Original) The image pixel structure of claim 1, wherein the substrate is n-type, and the implants are p-type.

4. (Original) The image pixel structure of claim 1, wherein an upper portion of said implant region is farther away from the region beneath said gate than the other portions of the implant.

5. (Currently Amended) The image pixel structure of claim 1, wherein said first portion is nearest the substrate surface in the implant region.

6. (Original) The image pixel structure of claim 5, wherein the implant dose of the first portion is between $2E11$ - $1E13/cm^2$.

7. (Canceled)

8. (Previously presented) The image pixel structure of claim 1, wherein the implant dose of the second portion is between $2E11$ - $1E13/cm^2$.

9. (Previously presented) The image pixel structure of claim 1, wherein the implant region includes a third portion, said third portion being underneath the second portion in the implant region.

10. (Original) The image pixel structure of claim 9, where the implant dose of the third portion is between $2E11$ - $1E13/cm^2$.

11. (Original) The image pixel structure of claim 9, wherein the first, second, and third portions of the implant region are formed by implants angled between 0 and 30 degrees in the direction of the gate, said angle being measured away from a line normal to the surface of the substrate, with at least one of the implants being at an angle greater than 0 degrees.

12. (Original) The image pixel structure of claim 11, wherein the third portion extends further than the first and second portions towards the region of said substrate beneath said gate.

13. (Original) The image pixel structure of claim 9, wherein the implant angle for the first and second portions of the implant region is between 0-15 degrees, and the implant angle for the third portion is between 0-30 degrees, at least one of said implant angles being greater than 0 degrees.

14. (Original) The image pixel structure of claim 12, wherein the implant angle for the first and second portions of the implant region is between 0-10 degrees, and the implant angle for the third portion is between 0-15 degrees.

15. (Original) The image pixel structure of claim 11, wherein the second portion extends further than the first and third portions towards the region of said substrate beneath said gate.

16. (Original) The image pixel structure of claim 9, wherein the implant region includes a fourth portion, said fourth portion being lateral to the second portion in the direction of the gate.

17. (Original) The image pixel structure of claim 16, where the implant dose of the fourth portion is between $2E11$ - $1E13/cm^2$.

18. (Original) The image pixel structure of claim 16, wherein the fourth portion extends further than the first, second, and third portions towards the region of said substrate beneath said gate.

19. (Original) The image pixel structure of claim 18, wherein the first, second, and third portions of the implant region are formed by implants angled between 0 and 5 degrees in the direction of the gate, said angle being measured away from a line normal to the surface of the substrate.

20. (Original) The image pixel structure of claim 19, wherein the fourth portion is formed by an implant angled between 10 and 30 degrees in the direction of the gate, said angle being measured away from a line normal to the surface of the substrate.

21. (Original) The image pixel structure of claim 1, wherein at least one of said portions of said implant region is angled.

22. (Original) The image pixel structure of claim 1, wherein the image pixel structure is a CCD imager.

23. (Original) The image pixel structure of claim 1, wherein the image pixel structure is a CMOS imager.

24. (Original) The image pixel structure of claim 23, wherein said image pixel structure is one of a three transistor (3T), four transistor (4T) five transistor (5T), six transistor (6T) and seven transistor (7T) structure.

25. (Original) The image pixel structure of claim 1, wherein said gate includes a gate oxide and a conductor.

26. (Original) The image pixel structure of claim 25, wherein said conductor contains at least one of poly-silicon, silicide, metal, and any combination of poly-silicon, silicide and metal.

27. (Original) The image pixel structure of claim 25, wherein said gate includes an insulator over the conductor.

28. (Original) The image pixel structure of claim 27, wherein the insulator is formed from at least one of oxide, nitride, metal oxide, and any combination of oxide, nitride, and metal oxide.

29-53. (Canceled)

54. (Currently Amended) A pixel imager system, comprising:

- (i) a processor; and
- (ii) a CMOS imaging device coupled to said processor and including:

a pixel array, at least one pixel of said array comprising:

a semiconductor substrate of a first conductivity type having a surface;

a gate over a surface of the substrate; and

a photodiode, within said substrate, said photodiode including an implant region of a second conductivity type, a first portion of said implant region which extends further towards a region of said substrate beneath said gate than a second portion of said implant region,

wherein said second portion is substantially underneath said first portion such that at least a portion of a lower boundary of said first portion forms an upper boundary for said second portion.

55. (Original) The pixel imager system of claim 54, wherein the substrate is p-type, and the implants are n-type.

56. (Original) The pixel imager system of claim 54, wherein the substrate is n-type, and the implants are p-type.

57. (Original) The pixel imager system of claim 54, wherein an upper portion of said implant region is farther away from the region beneath said gate than the other portions of the implant.

58. (Previously presented) The pixel imager system of claim 54, wherein said first portion is nearest the substrate surface in the implant region.

59. (Original) The pixel imager system of claim 58, wherein the implant dose of the first portion is between $2E11$ - $1E13/cm^2$.

60. (Canceled)

61. (Previously presented) The pixel imager system of claim 54, wherein the implant dose of the second portion is between $2E11$ - $1E13/cm^2$.

62. (Previously presented) The pixel imager system of claim 54, wherein the implant region includes a third portion, said third portion being underneath the second portion in the implant region.

63. (Original) The pixel imager system of claim 62, where the implant dose of the third portion is between 2×10^{11} - 1×10^{13} /cm².

64. (Original) The pixel imager system of claim 62, wherein the first, second, and third portions of the implant region are formed by implants angled between 0 and 30 degrees in the direction of the gate, said angle being measured away from a line normal to the surface of the substrate, with at least one of the implants being at an angle greater than 0 degrees.

65. (Original) The pixel imager system of claim 64, wherein the third portion extends further than the first and second portions towards the region of said substrate beneath said gate.

66. (Original) The pixel imager system of claim 62, wherein the implant angle for the first and second portions of the implant region is between 0-15 degrees, and the implant angle for the third portion is between 0-30 degrees, at least one of said implant angles being greater than 0 degrees.

67. (Original) The pixel imager system of claim 65, wherein the implant angle for the first and second portions of the implant region is between 0-10 degrees, and the implant angle for the third portion is between 0-15 degrees.

68. (Original) The pixel imager system of claim 64, wherein the second portion extends further than the first and third portions towards the region of said substrate beneath said gate.

69. (Original) The pixel imager system of claim 62, wherein the implant region includes a fourth portion, said fourth portion being lateral to the second portion in the direction of the gate.

70. (Original) The pixel imager system of claim 69, where the implant dose of the fourth portion is between $2E11$ - $1E13/cm^2$.

71. (Original) The pixel imager system of claim 69, wherein the fourth portion extends further than the first, second, and third portions towards the region of said substrate beneath said gate.

72. (Original) The pixel imager system of claim 71, wherein the first, second, and third portions of the implant region are formed by implants angled between 0 and

5 degrees in the direction of the gate, said angle being measured away from a line normal to the surface of the substrate.

73. (Original) The pixel imager system of claim 72, wherein the fourth portion is formed by an implant angled between 10 and 30 degrees in the direction of the gate, said angle being measured away from a line normal to the surface of the substrate.

74. (Original) The pixel imager system of claim 54, wherein at least one of said portion of implant regions are angled.

75. (Original) The pixel imager system of claim 54, wherein the pixel imager system is a CCD imager.

76. (Original) The pixel imager system of claim 54, wherein the pixel imager system is a CMOS imager.

77. (Original) The pixel imager system of claim 76, wherein said imager device is one of a three transistor (3T), four transistor (4T) five transistor (5T), six transistor (6T) or seven transistor (7T) architecture.

78. (New) An imager pixel structure comprising:

a semiconductor substrate of a first conductivity type having an upper surface;

a transistor gate structure formed over the upper surface of the substrate;

a photosensor within said substrate, said photosensor including in implant region of a second conductivity type, said implant region including first, second, and third implant portions constructed such that said first implant portion extends further towards a region of said substrate beneath said gate than at least one of said second and third implant portions,

wherein said second portion is adjacent to and at least partially underneath said first portion and said third portion is adjacent to and substantially underneath said first portion.

79. (New) The image pixel structure of claim 78, wherein said first implant portion extends further than both said second and third regions extend toward said region in the substrate beneath said gate structure.

80. (New) The image pixel structure of claim 78, wherein the first, second, and third portions of the implant region are formed by implants angled between 0 and 30 degrees in the direction of the gate, said angle being measured away from a line normal to the surface of the substrate, with at least one of the implants being at an angle greater than 0 degrees.

81. (New) The image pixel structure of claim 78, wherein the third portion extends further than the first and second portions towards the region of said substrate beneath said gate.

82. (New) The image pixel structure of claim 80, wherein the implant angle for the first and second portions of the implant region is between 0-15 degrees, and the implant angle for the third portion is between 0-30 degrees, at least one of said implant angles being greater than 0 degrees.